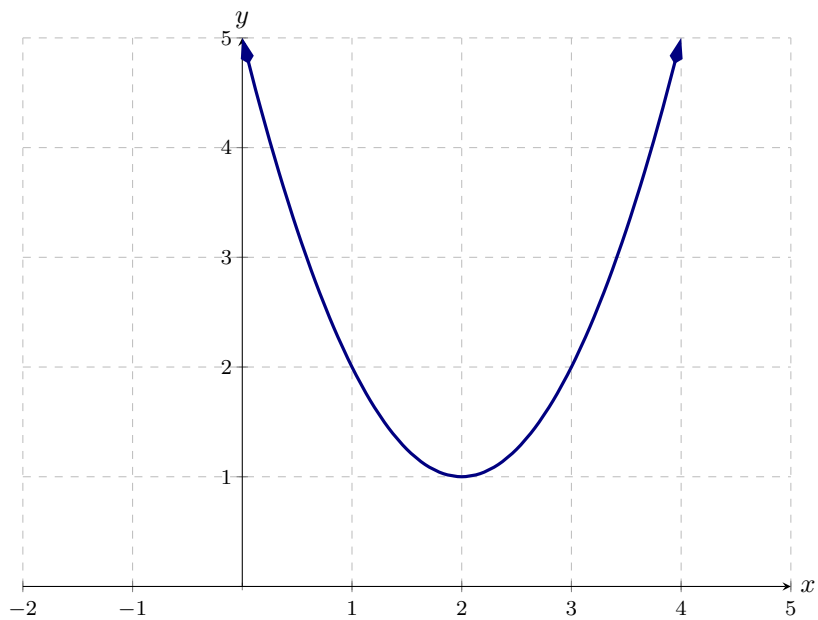
**Exercise 1** *The function given by $f(x) = 3(x-2)^2 + 1$ (graphed below) is not a one-to-one function on $(-\infty, \infty)$. If we restrict the domain, however, it can be made to be one-to-one.*




*Find a formula for $f^{-1}(x)$ when $f$ is restricted to $(-\infty, 2]$.*

$$f^{-1}(x) = \boxed{2 - \sqrt{\frac{x-1}{3}}}$$

***Hint:*** *We're starting with $y = f(x)$, so that's:*

$$y = \boxed{3(x-2)^2 + 1}$$

*Swap $x$ and $y$.*

$$x = \boxed{3(y-2)^2 + 1}$$

*Solving for $y$ you find two solutions. They are:*

$$y = 2 - \sqrt{\boxed{\frac{x-1}{3}}}$$

$$y = 2 + \sqrt{\boxed{\frac{x-1}{3}}}$$

*The domain of $f$ was restricted to $(-\infty, 2]$, which means we want the range of $f^{-1}$ to be $(-\infty, 2]$. Which of the two solutions you found give outputs which are not greater than 2?*